REMARKS/ARGUMENTS

Initially, it should be noted that claims 31-48 have been cancelled by the Applicant. More particularly, the Applicant requested at the time of filing that only claims 1-31 be examined by the Examiner. Claim 1 has been amended to additionally recite the features recited in claim 3. In addition, claim 11 has been amended to add the preposition "to" between "bonded and the," and other minor typographical corrections have been made. Accordingly, it is respectfully submitted that no substantive claim amendment has been made. As such, it is respectfully submitted that this amendment does NOT necessitate a new search by the Examiner.

In the Office Action, the Examiner has rejected claims 1-30 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,085,688 (*Lymberopoulos et al.*) as applied to claims 31-35 and further in view of *Lu et al.* (EP 0821397 A2). This rejection is traversed below for at least the following reasons:

***(a) Lymberopoulos et al.* does NOT teach or suggest an electromagnet arrangement being configured so as to result in a radial variation in a controlled magnetic field within a plasma processing chamber**

In the Office Action, the Examiner has asserted that the magnetic field taught by *Lymberopoulos et al.* need not be perpendicular to the substrate. To support this assertion, the Examiner has referenced Fig. 11 and Col. 7, lines 24-31 of *Lymberopoulos et al.* (Office Action, page 3). Contrary to the Examiner's assertion, it is very respectfully submitted that Fig. 11 or the section of *Lymberopoulos et al.* cited by the Examiner does NOT teach or suggest that the magnetic field can be non-perpendicular to the substrate surface. In fact, *Lymberopoulos et al.* clearly states that the magnetic field generated within the plasma reactor should have lines of force oriented perpendicular to the substrate surface (*Lymberopoulos et al.*, Abstract). Hence, it is respectfully submitted that *Lymberopoulos et al.* specifically teaches using magnetic field lines that are perpendicular to the substrate surface in order to achieve its main objective (i.e., reducing uneven charge build up occurring at a feature). This is further evident from Figs. 10, 11, 12 and 13 of *Lymberopoulos et al.* It should be noted that the lines of magnetic force (146) illustrated in Fig. 11 are also perpendicular to the

substrate (130). In contrast, for example, Fig. 2A and 2B of the present application illustrate lines of magnetic field at different radial locations. Clearly, the lines depicted in the present application include radial locations that are not in an axial direction perpendicular to the surface of the substrate.

(b) *Lymberopoulos et al.* does NOT teach or suggest: an electromagnet arrangement being configured so as to result in a radial variation in a controlled magnetic field within a plasma processing chamber to affect processing uniformity across a substrate

Initially, it is respectfully submitted that *Lymberopoulos et al.* pertains to reducing uneven charge build up that occurs at a given feature. (Please see, for example, Fig. 1 of *Lymberopoulos et al.* illustrating an uneven charge build up in a single contact hole). Contrary to the Examiner's assertion, it is respectfully submitted that controlling the uniformity of charge distribution does NOT necessarily result in improved uniformity of the etch process. In other words, the cause of uneven charge distribution on an etched feature is not plasma uniformity.

As is known in the art, "uneven charge build up" and "plasma uniformity" are different concepts. Uneven charge distribution is caused by the difference in random velocities of electrons and/or ions. It should also be noted that *Lymberopoulos et al.* states that controlling the magnetic field can result in controlling electron temperature and ion density near by the surface of the substrate (*Lymberopoulos et al.*, Abstract). Accordingly, it is respectfully submitted that the main objective of *Lymberopoulos et al.* is controlling uneven charge distribution on an etched feature. Uneven charge distribution, however, is related to electron temperature and ion density. In other words, *Lymberopoulos et al.* teaches controlling the magnetic field in order to reduce uneven charge build up occurring at a feature (*Lymberopoulos et al.*, Abstract). Hence, the main objective of *Lymberopoulos et al.* is NOT improving processing uniformity across the substrate.

It is noted that *Lymberopoulos et al.* merely states that in addition to reducing uneven charge build up, the magnetic field can be used to selectively control plasma density (*Lymberopoulos et al.*, Col. 10, lines 9-21). However, it should also be noted that *Lymberopoulos et al.* does not elaborate further or teach that the magnetic field

should be used any differently than is used to reduce uneven charge build up in order to control plasma density (i.e., lines of force that are not perpendicular should be used to control plasma density). As noted above, *Lymberopoulos et al.* specifically teaches that the magnetic field generated within the plasma reactor should have lines of force oriented perpendicular to the substrate surface (*Lymberopoulos et al.*, Abstract). Again, this is further evident because all of the magnetic fields illustrated in *Lymberopoulos et al.* have lines of force oriented perpendicular to the substrate surface (*Lymberopoulos et al.*, Fig 10, 11, 12 and 13). Accordingly, the only reasonable assumption is that *Lymberopoulos et al.* suggests to use lines of force oriented perpendicular to the substrate surface in order to selectively control plasma density in the same manner used to reduce uneven charge build up.

Contrary to the Examiner's assertion, it is therefore respectfully that *Lymberopoulos et al.* NOT teach radial variation in the controlled magnetic field within a plasma processing chamber to affect processing uniformity across a substrate. Moreover, it is respectfully submitted that *Lymberopoulos et al.* cannot possibly teach or even remotely suggest this feature as it teaches away from using a radial variation in the controlled magnetic field because of its clear and unequivocal use of lines of force oriented perpendicular to the substrate surface to reduce uneven charge build up.

(c) It would NOT have been obvious to one of ordinary skilled in the art at the time of the invention to control a magnetic field in the region proximate to the antenna to affect processing uniformity across a substrate

In the Office Action, the Examiner has noted that *Lymberopoulos et al.* does NOT teach controlling the magnetic field in the region proximate to the antenna (Office Action, page 4). However, the Examiner has asserted that it would NOT have been obvious to one of ordinary skilled in the art at the time of the invention to control the magnetic field in the region proximate to the antenna because such control would have been anticipated to produce an expected result of process uniformity (Office Action, page 4).

Initially, it is respectfully submitted that the Examiner has not made a prima facie case of obviousness because, among other things, the Examiner has NOT provided any factual basis in a cited reference or general knowledge that provides a motivation or

suggestion for controlling the magnetic field in the region proximate to the antenna (See, for example, MPEP §2143). Moreover, the Examiner has NOT even provided a factual basis that supports the assertion that *Lymberopoulos et al.* can be modified to teach the claimed invention (i.e., controlling the magnetic field in the region proximate to the antenna is compatible with the lines of force used by *Lymberopoulos et al.* which are clearly oriented perpendicular to the substrate surface). (*Lymberopoulos et al.*, Fig 10, 11, 12 and 13)

Furthermore, the mere fact that a reference can be modified does NOT render the resultant modification obvious unless the prior art also suggests the desirability of the modification (See, for example, MPEP §2143, paragraph 3). In this case, the Examiner's has merely alleged that process uniformity is the anticipated result of controlling the magnetic field in the region proximate to the antenna. However, the Examiner has NOT provided any factual basis to support this assertion, and thus has failed to provide a factual basis that suggests the desirability of modifying *Lymberopoulos et al.* Accordingly, it is respectfully submitted that the Examiner's rejection is improper and should be withdrawn.

Still Further, it is respectfully submitted that it is well known in the art that plasma processing is an unpredictable art where a seemingly insignificant change in each one of several different variables can markedly affect the uniformity of the plasma processing (See, for example, MPEP §2143.02). Accordingly, it is respectfully submitted that a reasonable expectation of success was lacking at the time the invention was made to control the magnetic field in the region proximate to the antenna.

(d) The combination of *Lymberopoulos et al.* and *Lu et al.* does NOT teach or suggest: an electromagnet arrangement configured so as to result in a radial variation in a controlled magnetic field in a region proximate to a coupling window and antenna within a plasma processing chamber which is made from material selected from a group of materials consisting of silicon carbide, quartz, silicon, silicon dioxide, carbon, boron carbide, and boron nitride

For similar reasons as noted above, it is respectfully submitted that the Examiner has failed to provide a motivation or suggestion in *Lymberopoulos et al. or Lu et al.* for combining a radial variation in a controlled magnetic field in a region proximate to a

coupling window and antenna with the claimed material for the processing chamber to positively affect processing uniformity across a substrate. Furthermore, for similar reasons as noted above, it is respectfully submitted that a reasonable expectation of success was lacking at the time the invention was made to combine a radial variation in the controlled magnetic field in a region proximate to a coupling window and antenna with the claimed material for the chamber to positively affect processing uniformity across a substrate.

CONCLUSION

Based on the foregoing, it is submitted that all pending claims are patentably distinct over the cited art of record. Additional limitations recited in the independent claims or the dependent claims are not further discussed because the limitations discussed above are sufficient to distinguish the claimed invention from the cited art. Accordingly, Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner.

Applicants hereby petition for an extension of time which may be required to maintain the pendency of this case, and any required fee for such extension or any further fee required in connection with the filing of this Amendment is to be charged to Deposit Account No. 500388 (Order No. LAM1P128D1). Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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